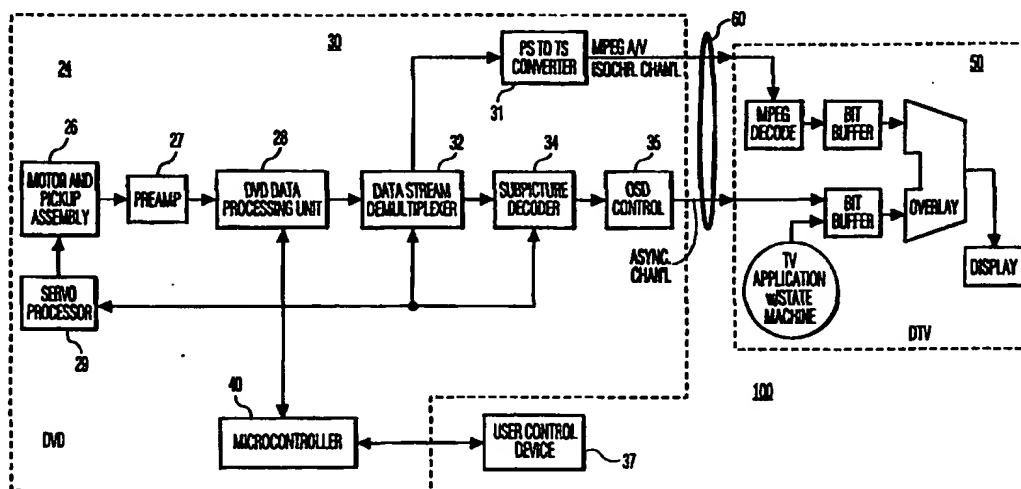




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(54) Title: DIGITAL BASEBAND INTERFACE FOR A DVD PLAYER



(57) Abstract

Managing interoperability of digital devices such as a digital video disc player and a digital television interconnected via a digital bus is provided. This interoperability is based on the IEEE 1394 serial bus for the physical and link layers and makes use of AV/C or CAL as the control language. This invention provides for transferring a DVD subpicture that has been transformed into a bit-mapped on-screen display (OSD) format via an asynchronous channel of the interconnecting serial bus.

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DIGITAL BASEBAND INTERFACE FOR A DVD PLAYER

Field of the Invention

5 This invention concerns a method for managing the interoperability of digital devices such as a digital video disc player and a digital television interconnected via a digital bus. More particularly, the invention involves a system for processing digital video disc (DVD) subpictures by a digital television.

10

Background of the Invention

Video signal processing systems that utilize storage media having digitally compressed video and audio information recorded thereon include, amongst other devices, a digital video disc player adapted to process information stored in accordance with the digital video disc (DVD) specification. The information on a DVD formatted disc is recorded as discrete packets of data, in accordance with the applicable video and audio data compression standards, wherein designated packets carry data associated with various data streams, such as alternative video angles, audio tracks, subpicture streams and navigation information. A video disc player reading a DVD formatted disc may be controlled to display certain packets of data and skip over others. A single disc may be authored to allow playback of multiple camera angles, story endings, scenes according to a ratings content, etc. DVD subpictures are used as the graphical user interface (GUI) for such features as providing the user the ability to select from one of several different videos on a disc. Using this capability, the DVD system can be used to prevent unauthorized access to information on a particular disc as well as seamlessly provide multiple variations of a video title in accordance with user commands. Current DVD players mix the decoded subpicture information with the decoded video into a single analog video signal for transport to a television.

35

A device such as a DVD player may be coupled to other devices, such as a display device, a video/audio recording device, audio equipment and communicate with these other devices via a data bus. Such communication occurs in accordance with a bus protocol. Examples of

bus protocols include the Consumer Electronics Bus (CEBus) and the IEEE 1394 High Performance Serial Bus. A bus protocol typically provides for communicating both control information and data. For example, CEBus control information is communicated on a "control
5 channel" having a protocol defined in Electronics Industries Association (EIA) specification IS-60. On an IEEE 1394 serial bus, control information is generally passed using the asynchronous services of the serial bus. Control information for a particular application can be defined using a programming language such as for
10 example, Common Application Language (CAL) or AV/C.

Summary of the Invention

This invention resides, in part, in the inventor's recognition of the
15 below mentioned problems associated with processing the DVD subpictures and navigation control in the digital television. Today, digital video disc (DVD) players process digitally compressed video and audio information stored in accordance with the digital video disc (DVD) specification. This processing includes the conversion of the
20 compressed digital stream to a standard signal (e.g., an NTSC or PAL signal). A remote control device or the front panel of the DVD player is used to produce a "quasi-interactive" program. That is, in response to a user command, a DVD subpicture is generated and combined with the decoded program stream prior to converting the digital stream to
25 an NTSC signal. The DVD subpicture may be thought of as a menu identifying available user initiated options. Navigation through the program is achieved in response to selection of one of these options. Thus navigation information may be thought of as logic that is
30 executed in response to the selection of one of the available options identified in the DVD subpicture.

Video decoding could be performed in a digital apparatus, for example, a digital television (DTV) or digital set-top box, however, it is difficult and expensive to mix the subpicture data with the video in
35 the DVD player prior to transport to the digital apparatus. For simplicity and convenience of comprehension, the remaining discussion of the present invention will encompass the utilization of a digital television although this invention is equally applicable for use with a digital set-top box. At present, DTVs do not support run-

length encoded format that is used for DVD subpictures. The advent of digital television receivers eliminates the burden of converting the digital stream produced in a digital video disc player to an NTSC signal, thereby creating a unique ability to harness the benefit of the digital signal by processing the digital stream within the digital television. However, the additional requirement of decoding DVD subpictures and interpreting DVD navigation information in the digital television would greatly increase the cost and complexity of the digital television. This invention also resides, in part, in providing an apparatus and method for solving the described problems.

The present invention provides for receiving, in a digital television, bit-map digital data representative of a DVD subpicture and combining the bit-map digital data with a decoded content stream received from the DVD disc. Particularly, the present invention provides a digital video signal processing apparatus and method for receiving from a digital video disc player a program content stream representative of a programmed event; decoding the program content stream to generate a signal suitable for display; receiving from the digital video disc player digital data suitable for display associated with the program content stream; and combining the digital data received from the digital video disc player and the program content stream to produce a signal representative of a combined image suitable for display. The program content stream comprises data configured in a compressed format.

Another aspect of the present invention provides for receiving subsequent displayable digital data representative of an updated portion of the previously received digital data; and updating the combined displayable image with the received subsequent displayable data to produce an updated combined displayable image. The step of updating being responsive to user input received by the digital video disc player.

Yet another aspect of the present invention provides for a system for controlling a digital video disc player interconnected by a digital bus to a digital television. Particularly, the digital video disc player processes a program content stream of a digitally compressed format received from a digital video disc received in a digital video disc player to generate an audio/video program stream and a subpicture stream; transmits the audio/video program stream to the digital television via an isochronous

channel of the digital bus; processes the subpicture stream to generate displayable digital data (e.g., bit-map OSD); and transmits the displayable digital data to the digital television via an asynchronous channel of the digital bus.

5

Brief Description of the Drawings

The invention may be better understood by referring to the enclosed drawing in which:

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Figure 1 shows, in simplified block-diagram form, a typical digital video disc player.

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Figure 2 shows, in simplified schematic block-diagram form, a system illustrating the interoperability of the digital video disc player of Figure 1 employing the present invention.

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Figure 3 shows, in simplified schematic block-diagram form, an alternate embodiment of the system shown in Figure 2.

In the drawings, reference numerals that are identical in different figures indicate features that are the same or similar.

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Detailed Description of the Drawings

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The use of IEEE 1394 serial bus has been suggested for many applications within a Home Network environment. It is being discussed within Video Electronics Standards Association (VESA) for use as a "whole home network." It is being built into the next generation PCs and will be used for many local peripherals including disc drives as well as digital audio/video consumer electronic devices such as digital televisions (DTVs) and digital video disc (DVD) players.

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IEEE-1394 is a high speed, low cost digital serial bus developed for use as a peripheral or back-plane bus. Some of the highlights of the bus include: dynamic node address assignments, data rates of 100, 200, and 400 Mbits/sec, asynchronous and isochronous modes, fair bus arbitration, and consistency with ISO/IEC 13213.

Figure 1 is a block diagram showing the basic elements of a typical digital video disc (DVD) player 24. The construction and operation of these elements are known to one of ordinary skill in the art and will not be discussed in detail here. Disc player 24 comprises motor and pickup assembly 26 which, under the control of servo processor 29, spins the disc and reads the information stored thereon. Preamp 27 and DVD data processing unit 28 translate the electrical pulses from motor and pickup assembly 26 into digital data that can be further processed by digital audio/video decoder unit 30. DVD data processing unit 28 typically performs functions such as demodulation, error correction and descrambling of the raw data read from the disc so that the data is in a suitable format for decoder unit 30. Error correction may involve data processing such as that associated with a Reed Solomon algorithm.

Decoder unit 30 receives the demodulated, error corrected and descrambled data, processes the data, and provides the appropriate video and audio signals to a display unit, such as a NTSC television set. Particularly, decoder unit 30 comprises data stream demultiplexer 32 which demultiplexes the data from data processing unit 28 into a plurality of separate data streams, including a video stream, an audio stream and a subpicture stream, and provides the data streams to their respective data decoders. Video decoder 31 receives the video stream and provides a video signal to mixer 33. Subpicture decoder 34 receives the subpicture stream and provides data to on screen display (OSD) control 35 which provides OSD video signals to mixer 33. The combined video signal from mixer 33 is provided to NTSC/PAL encoder 42 which provides a video signal that conforms to the appropriate video signal standard to a video display device, such as an NTSC television. Audio decoder 36 receives the audio streams from data stream demultiplexer 32 and provides the appropriate audio signals to an audio system.

Microcontroller 40 controls the operation of digital video disc player 24. Microcontroller 40 is coupled to user control device 37, which may comprise IR remote control devices, front panel buttons or the like, and translates data from user control device 37 to control the operation of the various elements of disc player 24 described above. Typically, microcontroller 40 is also configured to control various

access features of disc player 24 including, but not limited to, parental lock out, descrambling or decryption information and navigation data. Microcontroller 40 may be embodied in various forms, including, but not limited to, a dedicated integrated circuit, or a part of a
5 decoder/controller unit.

The combined video signal generated by mixer 33 may be forwarded to the digital television via an IEEE 1394 digital bus. Unfortunately, the through-put of the decoded and uncompressed video signal may
10 degrade system operation due to the band width requirement of transferring such a video signal via a IEEE 1394 digital bus, for example, 30 frames/second X 720 horizontal pixels X 480 vertical pixels X 24 bits/pixel = 250 Mbits/second. The band width for present IEEE 1394 serial buses is typically limited to 200
15 Mbits/second. Even with a 400 Mbit/second serial bus, after subtracting the band width necessary for overhead, transferring such decoded and uncompressed video signals would be difficult. For comparison purposes, such a bandwidth correlates to about one-sixth the size of a decoded HDTV signal. As described in further detail
20 below, the present invention resides in part in recognition of this problem, and in part, in identifying a solution thereto.

Today's digital televisions provide many benefits for digital video processing. Figure 2 defines a system 100 for providing
25 interoperability between DVD player 24 and digital television (DTV) 50 via an IEEE 1394 serial bus 60. In such a system 100, interoperability may be achieved by transferring the compressed MPEG stream from DVD player 24 to an MPEG decoder integral with DTV 50. Transferring DVD subpictures from DVD player 24 to a DTV
30 50 can be achieved using one of several formats. For example, a subset of HTML without the navigation features may be used to describe the OSD. Another possibility is to use a run-length-encoding format which is similar to the DVD subpicture format. However, the preferred embodiment involves transferring the actual information in
35 an OSD bit-map format. For example, an 8 bit/pixel, full screen, 640X480 OSD can be transferred in about 100 msec's utilizing 10% of the bandwidth of the 200 Mbit/sec IEEE 1394 serial bus.

Converting DVD subpictures to an OSD bit-map format and transferring the OSD bit-map subpicture directly from DVD player 24 to DTV 50 via an asynchronous channel of serial bus 60, for example, utilizing a "Pull" method, is described below. DVD player 24 processes the digitally compressed video and audio information stored on the video disc thereby generating a digital stream in an MPEG-PS (program stream) format. In one embodiment of the present invention the MPEG-PS stream is first converted to an MPEG-TS (transport stream) format by PS to TS Converter 39. The MPEG-TS audio/video digital stream is transferred to DTV 50 utilizing an isochronous channel of IEEE 1394 serial bus 60. The OSD bit-map subpicture is not transferred as a composite compressed MPEG video stream but is transferred as a bit-mapped OSD where the OSD may be overlaid in DTV 50 with the decoded MPEG audio/video stream prior to being displayed.

Transferring compressed MPEG-TS data via the digital bus eliminates the throughput and processing problems. The digital television may contain an MPEG Audio/Video Decoder which will be utilized for decoding the MPEG-TS stream. The user will still directly interface with DVD player 24 utilizing the respective user control device 37 (i.e., front panel or remote control). The responses of such user interaction is handled within DVD player 24 by decoding the MPEG sub-pictures and generating a bit-map subpicture OSD. The bit-map OSD may be transferred via an asynchronous channel of IEEE 1394 serial bus 60 to the OSD buffer located in DTV 50. The bit-mapped image is overlaid, within the digital television, with the decoded video MPEG signal. The combined (or overlaid) signal is then displayed.

Figure 3 shows an alternate embodiment of the present invention wherein the MPEG-PS stream is directly decoded by the MPEG decoder in the DTV. MPEG-PS streams require less processing power than MPEG-TS streams; thus broadcast decoders with sufficient packet buffers that utilize software for demultiplexing could be programmed to directly decode MPEG-PS streams. Thus, PS to TS Converter 39 is not required. The audio/video content stream in an MPEG-PS format is transferred over an isochronous channel of IEEE 1394 serial bus 60 to an MPEG decoder in DTV 50.

Utilizing a bit-map format for transfer of DVD subpictures allows (1) the DVD manufacturer to maintain the "look and feel" of the subpicture, (2) for freedom in the generation of the subpicture and (3) for dynamic updates (i.e. partial screen or even single pixel updates are possible). Compared to compressed representations, the bit-map representation requires less processing time to display because displaying such bit-mapped subpictures requires minimal interpretation and manipulation. Descriptive approaches, such as HTML, have a disadvantage of being difficult to specify and upgrade for typical consumer products.

To simplify the transfer of bit-mapped subpictures, a "Pull" method is preferably utilized. With this method, the bulk of the bit-map data is transferred from DVD player 24 to DTV 50 using the asynchronous channel of the IEEE 1394 digital bus. DTV 50 reads the bit-map data from the memory of the peripheral device (i.e., DVD player) by making use of at least one block read transaction of IEEE 1394. The display device is informed of the location and size of the bit-map data via a "trigger" command which is sent from DVD player 24 to DTV 50 when the DVD player 24 is ready to begin transferring data.

Other alternatives for transferring subpictures from DVD player 24 to DTV 50 include; (1) an asynchronous push method which primarily uses IEEE 1394 asynchronous write transactions initiated by DVD player 24 to write the bit-map data into DTV 50, (2) an isochronous transport method for broadcasting the bit-map data over one of the isochronous channels provided by IEEE 1394, (3) an asynchronous stream method for carrying the subpictures and (4) alternately, the bit-map data could be provided via a 8 VSB-T(trellis) or 16 VSB RF remodulated channel.

Once the subpicture is ready for transfer, DVD 24 sends a trigger message to DTV 50. A unique trigger message 22 may be utilized for each subpicture. Initiation of a block transfer usually occurs through the use of a trigger message from DVD 24 to DTV 50. A queue may be implemented in the display device so that trigger messages are processed in the same order in which they are received.

After a trigger message is received from the target, the OSD module in DTV 50 requests memory accesses (i.e., asynchronous reads) starting at the memory location specified in the trigger message. The display device reads all of the information associated with the subpicture and
5 begins to construct the actual bit-map image. At the same time, it informs DVD 24 that the block has been read so that DVD 24 may free up any memory it had allocated to the transfer of this data block. This subpicture is then displayed. DTV's 50 OSD controller (not shown) uses this data to construct the OSD and mix it with the
10 decoded MPEG video in DTV 50.

The time required for transfer of bit-map data through the digital bus may be calculated as follows. For example all the data required for a 640x480 OSD with 4 bits/pixel requires 1,228,800 bits. All of this
15 data can be transferred in about 150 ms assuming a 100 Mb/sec bus, a packet payload of 512 Bytes and assuming that we can transmit one packet each 500µsec. This time decreases even further when one takes into account that no OSD takes up this much space. Using only a quarter (typical) of the entire screen results in roughly 40 ms
20 transfer time. Small updates can be on the order of a few milliseconds.

Application Control Languages

In order for a consumer electronic device to interact with other
25 devices interconnected via a IEEE 1394 serial bus, a common set of commands must be defined. Three standard approaches for device modeling and control are CAL, AV/C and the approach adopted for the Universal Serial Bus (USB).

30 The design of control languages is based on the assumption that all consumer electronic products have a hierarchical structure of common parts or functions. CAL and AV/C are control languages that distinguish between logical and physical entities. For example, a television (i.e., a physical entity) may have a number of functional
35 components (i.e., logical entities) such as a tuner, audio amplifier, etc. Such control languages provide two main functions: Resource allocation and Control. Resource allocation is concerned with requesting, using and releasing Generic Network resources. Messages and control are transported by the FCP as defined in IEC-61883 and

discussed above. For example, CAL has adopted an object base methodology for its command syntax. An object contains and has sole access to a set number of internal values known as instance variables (IV). Each object keeps an internal list of methods. A method is an action that an object takes as a result of receiving a message. When a method is invoked, one or more IVs are usually updated. A message may include a method identifier followed by zero or more parameters. When an object receives a method, it looks through its list of methods for one which matches the method identified in the message. If found, the method will be executed. The parameters supplied with the message determine the exact execution of the method.

For a CAL implementation, all devices that are capable of displaying OSDs must implement the following OSD object. This object assumes Asynchronous PULL with trigger message approach. This object would be carried in the trigger message from DVD 24 to DTV 50. Digital television 50 would then pull the menu by reading it from DVD's 24 bus mapped memory space. The response of this request will be used by DVD 24 as an indication that the display device has read these update blocks.

OSD Update Trigger Object

2	OSD Update Trigger Object			(16) Data Memory
The object is used for triggering the OSD mechanism in display capable devices.				
IV	R/W	Type	Name	Context Function
a (61)	R	Numeric	size_of_block	size of "memory_block" in bytes (default value = 10)
b (62)	R	Numeric	length_of_record	length of current_record in bytes (default value = 10)
C (43)	R/W	Numeric	current_index	current record block pointed to (default value = 0)
l (6C)	R/W	Data ()	memory_block	In each record, 6 MSBs contain the offset and LSB contains the OSD_type, remaining 3 bytes represent the length of OSD in bytes.

Although the exemplary embodiment is described with reference to a digital video apparatus adapted to read compressed video and audio data from a disc and to process the data in accordance with the DVD specification, it is to be understood that the present invention may be

used in any video processing apparatus capable of processing digital video and audio information, wherein program related information included with the video and audio information can be used to selectively restrict the playback of certain video and audio
5 information on the disc.

While the invention has been described in detail with respect to numerous embodiments thereof, it will be apparent that upon a reading and understanding of the foregoing, numerous alterations to
10 the described embodiment will occur to those skilled in the art and it is intended to include such alterations within the scope of the appended claims. For example, the invention has been described with respect to DVD players, however this invention is equally applicable to any digital device processing at least one stream of compressed
15 digital data.

Claims

What is claimed:

1. A digital video signal processing apparatus comprising:
 - (a) means for receiving from a digital video disc player a
5 program content stream representative of a programmed event, said program content stream including data in a compressed format;
 - (b) means for decoding said program content stream to generate a video signal suitable for display;
 - (c) means for receiving from said digital video disc player digital
10 data suitable for display, said digital data being associated with said program content stream; and
 - (d) means for combining said digital data received from said digital video disc player and said video signal to produce a signal representative of a combined image suitable for display.
- 15 2. The digital video signal processing apparatus of claim 1 wherein said digital data is representative of a DVD subpicture associated with said program content stream.
- 20 3. The digital video signal processing apparatus of claim 2 further comprising
 - (a) means for receiving subsequent digital data suitable for display, said subsequent digital data being representative of an updated portion of said previously received digital data; and
 - 25 (b) means for updating said combined image with said received subsequent digital data to produce an updated combined image suitable for display, wherein said updating means is responsive to user input received by said digital video disc player.
- 30 4. The digital video signal processing apparatus of claim 3 wherein said digital data is bit-mapped data.

5. In combination in a system for controlling a digital video disc player interconnected by a digital bus to a digital television, the digital video disc player performing the steps of:

- (a) processing a program content stream including data in a compressed format received from a digital video disc received in said digital video disc player to generate an audio/video program stream and a subpicture stream;
- (b) transmitting, via an isochronous channel of said digital bus to said digital television, said audio/video program stream;
- (c) processing said subpicture stream to generate digital data, said digital data being suitable for display; and
- (d) transmitting, via an asynchronous channel of said digital bus to said digital television, said digital data.

6. The combination of Claim 5 further comprising the steps of:

- (a) receiving a user initiated command in response to said displayable digital data; and
- (b) generating an updated subpicture stream in response to said user initiated command.

7. The combination of Claim 5 wherein said audio/video stream is configured in an MPEG program stream format.

8. The combination of Claim 7 further comprising the step of:

converting said audio/video stream from an MPEG program stream to an MPEG transport stream.

9. A digital video signal processing apparatus performing the steps of:

- (a) receiving from a digital video disc player a program content stream representative of a programmed event, said program content stream including data in a compressed format;
- (b) decoding said program content stream to generate a video signal suitable for display;
- (c) receiving from said digital video disc player bit-map data representative of a subpicture associated with said program content stream, said bit-map data being suitable for display; and
- (d) combining said bit-map data received from said digital video disc player and said program content stream to produce a signal representative of a combined image suitable for display.

10. The digital video signal processing apparatus of Claim 9 further comprising the steps of:

- 5 (a) receiving subsequent bit-map data representative of an updated portion of said previously received subpicture; and
- (b) updating, in response to a user initiated command received by said digital video disc player, said combined image with said received subsequent bit-map data to produce an updated combined image suitable for display.

10

11. A digital video signal processing apparatus comprising:

- (a) means for receiving from a storage means a compressed digital data stream;
- (b) means for decoding said compressed digital data stream to
15 generate a video signal suitable for display;
- (c) means for receiving from said storage means bit-map data associated with said compressed digital data stream; and
- (d) means for combining said bit-map data received and said
20 video signal to produce a signal representative of a combined image suitable for display.

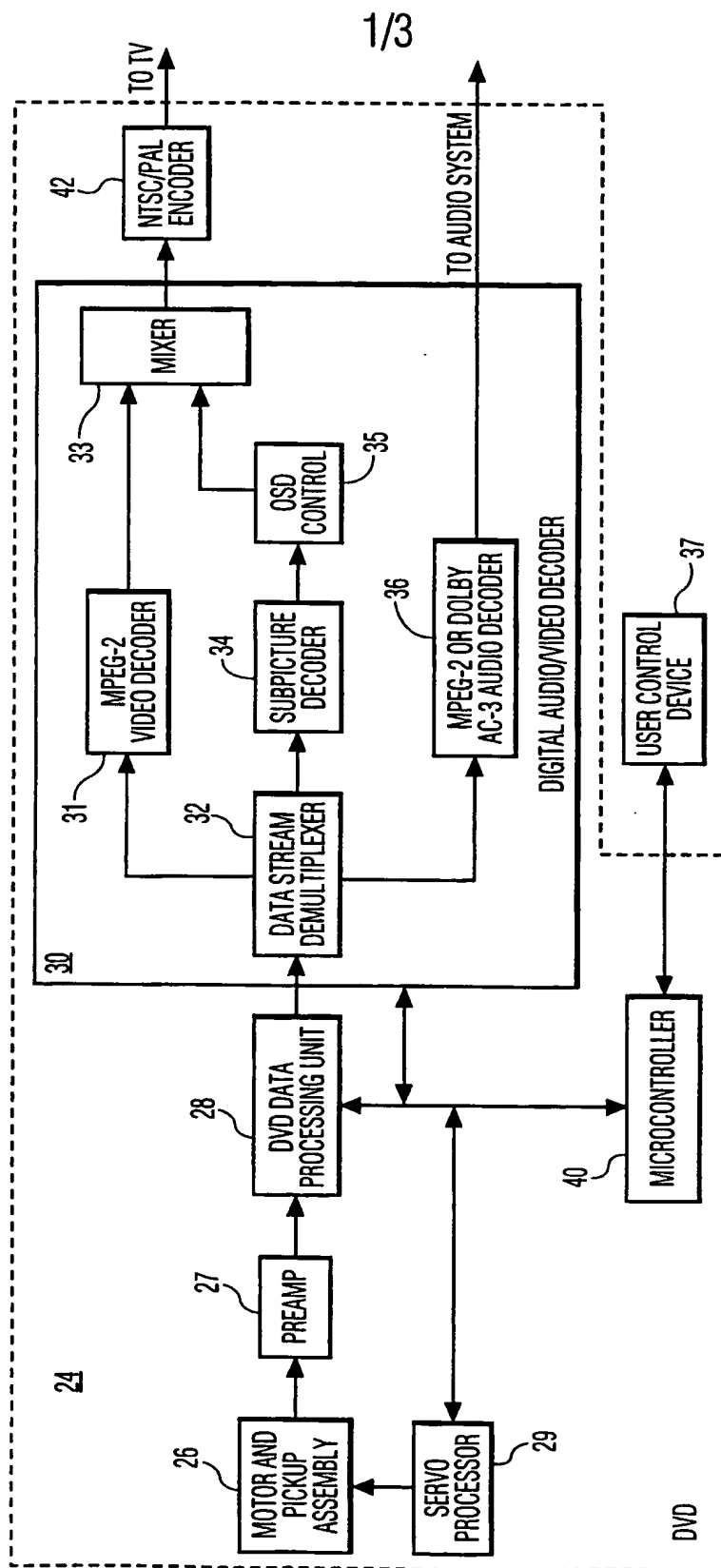


FIG. 1

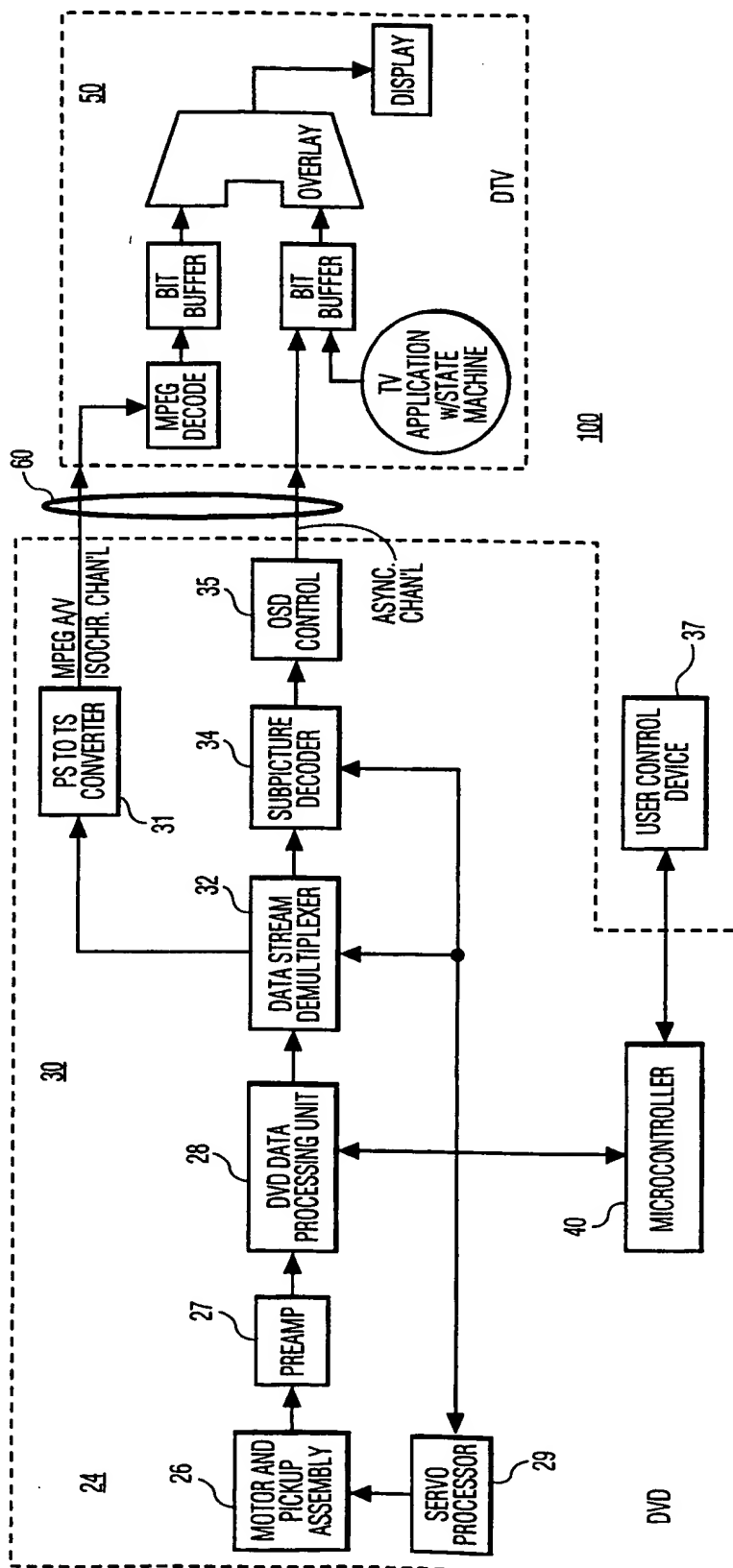


FIG. 2

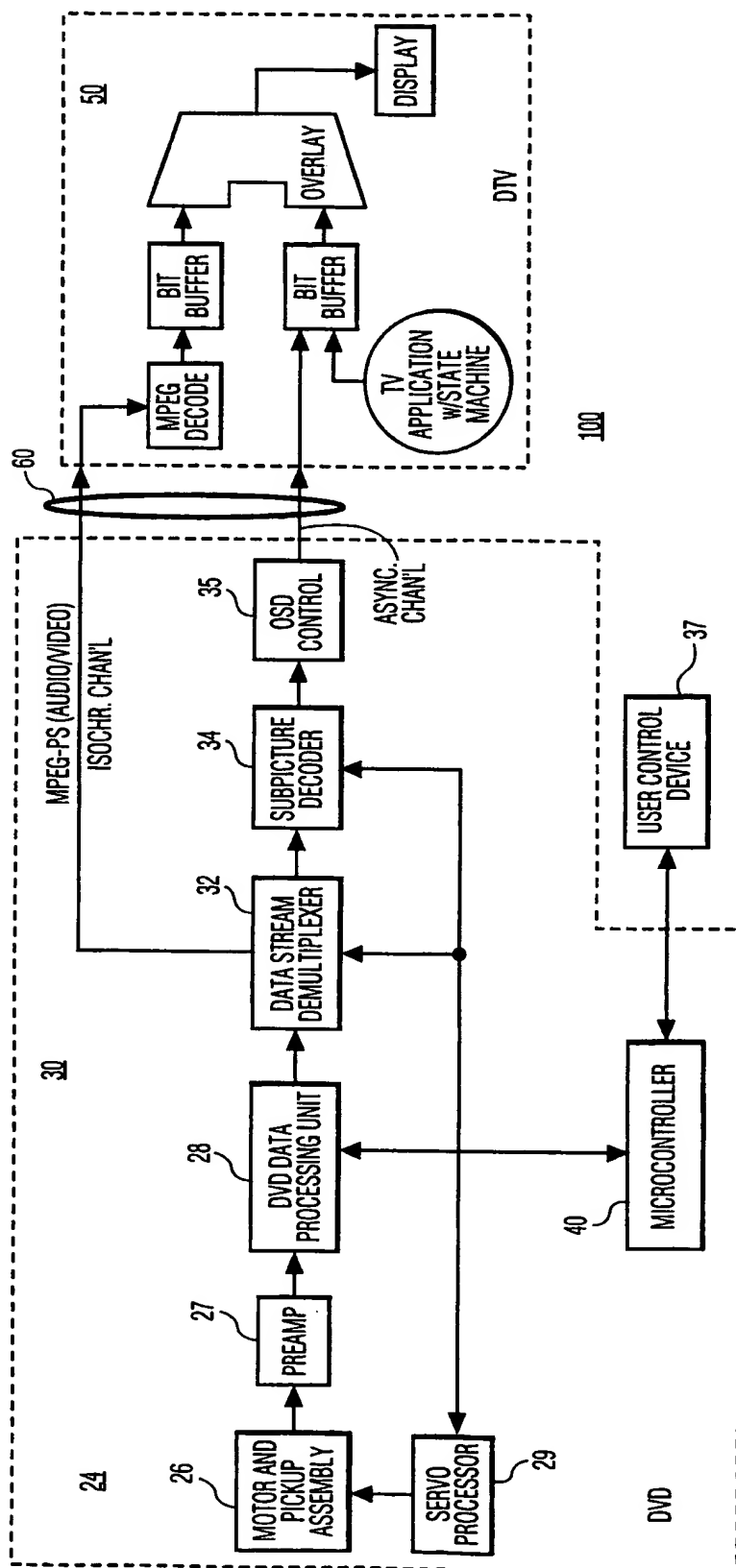


FIG. 3

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Applicant
THOMSON CONSUMER ELECTRONICS, INC. et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
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PATENT COOPERATION TREATY

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Applicant's or agent's file reference RCA 88884	<div style="display: flex; justify-content: space-between;"> <div>FOR FURTHER ACTION</div> <div>See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)</div> </div>	
International application No. PCT/US99/02498	International filing date (<i>day/month/year</i>) 04/02/1999	Priority date (<i>day/month/year</i>) 04/02/1998
International Patent Classification (IPC) or national classification and IPC H04N5/00		
Applicant THOMSON CONSUMER ELECTRONICS, INC. et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 9 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☒ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☒ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 04/08/1999	Date of completion of this report 24.05.2000
Name and mailing address of the international preliminary examining authority: <div style="display: flex; align-items: center;"> <div> European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 </div> </div>	Authorized officer Moorhouse, D Telephone No. +49 89 2399 8631



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/US99/02498

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-11 as originally filed

Claims, No.:

1-7 as received on 29/02/2000 with letter of 29/02/2000

Drawings, sheets:

1/3-3/3 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☒ the claims, Nos.: 9-11
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:

- ☐ restricted the claims.
☐ paid additional fees.
☐ paid additional fees under protest.
☐ neither restricted nor paid additional fees.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/US99/02498

2. ☒ This Authority found that the requirement of unity of invention is not complied and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is
- ☐ complied with.
- ☒ not complied with for the following reasons:

see separate sheet

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:
- ☒ all parts.
- ☐ the parts relating to claims Nos. .

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-7
	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-7
Industrial applicability (IA)	Yes:	Claims	1-7
	No:	Claims	

2. Citations and explanations

see separate sheet

VI. Certain documents cited

1. Certain published documents (Rule 70.10)

and / or

2. Non-written disclosures (Rule 70.9)

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/US99/02498

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/US99/02498

Concerning Box IV

The subject-matter of independent claims 1 and 3 on the one hand and independent claim 5 on the other hand is linked merely by the fact that compressed digital data is either sent from a DVD player or received in a DTV (operating method). However, transmission of data from a storage medium, whether tape or disc, via a digital bus to a DTV is known from at least the documents D2 and D4 (see below for document numbering).

Thus, the claims are not linked by a **single general inventive concept**, as required by Rule 13.1 PCT.

Since the lack of unity has arisen after amendment of the claims, and no time remained in the Chapter II procedure to apply the procedure relating to lack of unity (payment of fees, restriction of application), the IPEA has chosen, pursuant to Rule 68.1 PCT, not to invite the Applicant to restrict the application or pay additional fees.

Concerning Box V

The following documents are cited :-

- D1 : EP-A-0 737 009
- D2 : EP-A-0 703 713
- D3 : WO-A-97/33433 & EP-A-0 825 770
- D4 : EP-A-0 785 675
- D5 : EP-A-0 701 367

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/US99/02498

The WO version of D3 is valid prior art as regards the present application (cf. Rule 64.1 PCT). The EP version is published later, but is based on the same International Application and the same priority applications. It is therefore assumed that the disclosures are identical. For the purposes of this Written Opinion, the EP document will thus be used as a translation into English of the original Japanese disclosure in the WO publication.

The subject-matter of claims 1 to 7 lacks an inventive step, and therefore does not meet the requirement set out in Article 33 (3) PCT.

In detail, it is known from document D5, in the section bridging columns 2 and 3 thereof, to perform steps (a) and (b) of claim 1. Moreover, the connection of elements (12) (14) and (20) in the Figure of D5 renders step (d) of claim 1 obvious. The remaining step of claim 1, step (c) cannot be considered inventive in view of the disclosure of document D1, Figure 44, from which it is known to provide subpicture data outputted by a DVD in bit mapped form for further processing.

Thus, the subject-matter of claim 1 and corresponding apparatus claim 3 are derivable in an obvious manner from the combined disclosures of documents D1 and D5.

The additional features of claims 2 and 4 are rendered obvious by the disclosure of document D3 (see, for example, column 5, lines 37 to 51).

The subject-matter of independent claim 5 is rendered obvious by the combination of the disclosures of documents D4 and D2.

Document D2 discloses the use of an IEEE 1394 bus in a digital video environment. According to document D2, video and audio are transmitted via the isochronous bus channel, whereas commands and control data are transmitted via the asynchronous bus channel. It will be obvious to the skilled person reading documents D1 and D2, that the OSD data of document D1 is used to "control" the reproducing device, and could thus profitably be communicated via the said asynchronous IEEE 1394 bus channel. Moreover, it is known from document D4 to convert between MPEG-PS for storage on a medium such as a DVD and MPEG-TS for transmission over a digital bus. Since both documents relate to the transmission of MPEG data over an IEEE 1394 (P1394) digital bus, it would be obvious to combine their teachings.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/US99/02498

The result of this combination is the subject-matter of present independent claim 5.

The additional features of claim 6 are rendered obvious by the disclosures of document D1, Figure 44 (step (a)) and D2 (step (b)).

The additional features of claim 7 are rendered obvious by the disclosure of document D3 (see, for example, column 5, lines 37 to 51).

The following comments pertaining to the remaining documents cited in the International Search Report are applicable:

WO-A-97/10678 Discloses that, for cost reasons, a DVTR does not include MPEG encoding or decoding, but instead simply records and then replays an MPEG bitstream, with the consequence that OSD messages have to be generated and output separately. There is no mention of OSD bit maps, so that at least this part of the subject-matter of independent claims 1 and 3 is not suggested. There is no MPEG-PS to MPEG-TS conversion in the recorder, nor is there an IEEE 1394 or equivalent bus, so that the subject-matter of independent claim 5 is not hinted at.

WO-A-97/05743 Discloses the use of linked lists to create an OSD, but little else of relevance to present independent claims 1, 3 and 5.

Concerning Box VI

Certain published documents (Rule 70.10)

Application No. Patent No.	Publication Date (day/month/year)	Filing Date (day/month/year)	Priority Date (day/month/year)
WO-A-99/14945	25/03/1999	18/09/1998	18/09/1997
WO-A-99/14946	25/03/1999	18/09/1998	18/09/1997
EP-A-0 833 514	01/04/1998	24/09/1997	27/09/1996
EP-A-0 873 009	21/10/1998	24/09/1998	14/04/1997

The priority claims of the above applications **have not been checked**.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/US99/02498

It is to be noted that the subject-matter of all of claims 1 to 4 is disclosed in both of the WO documents. (See Figure 4 of WO-A-99/14945 and Figure 5 of WO-A-99/14946). In this context, it is to be noted that the wording "for operating a *digital video disc player*" is not limiting (Preliminary Examination Guidelines, PG-III, 4.8, first sentence).

Moreover, the subject-matter of claim 5 is disclosed in EP-A-0 833 514, in particular Figure 5 thereof.

The Applicant is advised that in the European phase, novelty objections would be raised on the basis of the above disclosures, should the applications in question enter the European phase and should the claims of the present application not be limited with respect to their present scope.

Concerning Box VII

Reference signs as defined in Rule 6.2 (b) are missing from the claims.

Concerning Box VIII

Claims 1, 3 and 7 lack clarity and/or support in the description, and therefore do not meet the requirement set out in Article 6 PCT. The objections are set out in detail below.

Claim 1

It is not at all clear, if this claim refers to features of a DTV. Further, it is not clear where in the description there is support for any other kind of "digital video signal processing apparatus" including the claimed features.

Further, it is not quite clear, what is meant by the wording "**programmed event**". This wording appears to hint at data relating to timer recording than to video programmes.

Claim 3

It is not clear, where in the description there is support for the use of a storage means other than a DVD (player).

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/US99/02498

In the definition of feature (c), it is not clear, **how** the bit-map data is **associated** with the compressed digital data stream. Is it a subpicture thereof ?

Further, it is not at all clear, how the data is "received" in steps (a) and (c), since no mention is made of a bus.

Claim 7

It is not clear from claim 7, that a **portion** of a previously received subpicture is updated, as is the case in claims 2 and 4.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/02498

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 H04N5/00 H04N5/775 H04N5/44 H04N5/445 G11B27/30

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04N G11B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 737 009 A (TOKYO SHIBAURA ELECTRIC CO) 9 October 1996 see abstract; figures 1,44 ---	1,2,9,11
X	WO 97 33433 A (KOMENO JUNICHI ;MATSUSHITA ELECTRIC IND CO LTD (JP)) 12 September 1997 see abstract	1-6,9-11
Y	---& EP 0 825 770 A (MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.) 25 February 1998	7,8 1-6,9-11
P,X	see column 3, line 29 - line 38	7,8
P,Y	see column 4, line 40 - column 6, line 33 see abstract; figure 1 ---	7,8
Y	EP 0 785 675 A (TOKYO SHIBAURA ELECTRIC CO) 23 July 1997	7,8
A	see column 1, line 27 - line 54 see abstract; figures 1,2 ---	5
	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

11 June 1999

Date of mailing of the international search report

17/06/1999

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/02498

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 97 10678 A (BLATTER HAROLD ; THOMSON CONSUMER ELECTRONICS (US)) 20 March 1997 see the whole document ---	1,2,9,11
X	EP 0 701 367 A (THOMSON CONSUMER ELECTRONICS) 13 March 1996 see the whole document ---	1,2,9,11
X	WO 97 05743 A (THOMSON CONSUMER ELECTRONICS) 13 February 1997 see the whole document ---	1-4,9-11
A	EP 0 703 713 A (SONY CORP) 27 March 1996 see column 1, line 39 - line 51 ---	5
P,A	EP 0 833 514 A (SONY CORP) 1 April 1998 see the whole document ---	1-11
P,A	EP 0 873 009 A (SAMSUNG ELECTRONICS CO LTD) 21 October 1998 see the whole document ---	1-11
E	WO 99 14945 A (CHATTERJEE AMIT KUMAR ; RHOADS STEVEN CHARLES (US); KURUCAY SABAN () 25 March 1999 see the whole document ---	1-6,9-11
E	WO 99 14946 A (CHATTERJEE AMIT KUMAR ; RHOADS STEVEN CHARLES (US); KURUCAY SABAN () 25 March 1999 see the whole document -----	1-6,9-11

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/02498

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
EP 0737009	A	09-10-1996	CA	2173701 A	07-10-1996
			CN	1141477 A	29-01-1997
			JP	2835317 B	14-12-1998
			JP	9233417 A	05-09-1997
			JP	8336103 A	17-12-1996
WO 9733433	A	12-09-1997	CN	1181858 A	13-05-1998
			EP	0825770 A	25-02-1998
EP 0785675	A	23-07-1997	JP	9200691 A	31-07-1997
			CA	2195161 A	17-07-1997
WO 9710678	A	20-03-1997	AU	6977496 A	01-04-1997
			AU	7071296 A	01-04-1997
			AU	7071396 A	01-04-1997
			AU	7109396 A	01-04-1997
			AU	7159296 A	01-04-1997
			CN	1200859 A	02-12-1998
			CN	1200858 A	02-12-1998
			CN	1201579 A	09-12-1998
			CN	1201580 A	09-12-1998
			CN	1201581 A	09-12-1998
			DE	69601583 D	01-04-1999
			EP	0850541 A	01-07-1998
			EP	0850542 A	01-07-1998
			EP	0850543 A	01-07-1998
			EP	0850544 A	01-07-1998
			EP	0853858 A	22-07-1998
			WO	9710679 A	20-03-1997
			WO	9710680 A	20-03-1997
			WO	9710681 A	20-03-1997
			WO	9710682 A	20-03-1997
EP 0701367	A	13-03-1996	CA	2156871 A	10-03-1996
			CN	1138796 A	25-12-1996
			JP	8181955 A	12-07-1996
			SG	32490 A	13-08-1996
			US	5625406 A	29-04-1997
WO 9705743	A	13-02-1997	AU	6596196 A	26-02-1997
			BR	9610169 A	11-08-1998
			CN	1197570 A	28-10-1998
			EP	0842582 A	20-05-1998
EP 0703713	A	27-03-1996	JP	8097837 A	12-04-1996
			US	5781599 A	14-07-1998
EP 0833514	A	01-04-1998	JP	10154373 A	09-06-1998
EP 0873009	A	21-10-1998	CN	1196527 A	21-10-1998
			JP	11016272 A	22-01-1999
WO 9914945	A	25-03-1999	WO	9914946 A	25-03-1999
WO 9914946	A	25-03-1999	WO	9914945 A	25-03-1999

ART 34 AMDT

Claims

1. A method for operating a digital video disc player interconnected by a digital bus to a digital video processing apparatus, the digital video processing apparatus performing the steps of:
- (a) receiving from a digital video disc player a program content stream representative of a programmed event, said program content stream including data in a compressed format;
 - (b) decoding said program content stream in said digital apparatus; characterized by:
 - (c) receiving from said digital video disc player bit-map data representative of a subpicture associated with said program content stream, said bit-map data being suitable for display; and
 - (d) combining, in said digital apparatus, said bit-map data received from said digital video disc player and said decoded program content stream to produce a signal representative of a combined image suitable for display.
2. The method of Claim 1 further characterized by the digital apparatus performing the steps of:
- (a) receiving subsequent bit-map data representative of an updated portion of said previously received subpicture; and
 - (b) updating, in response to a user initiated command received by said digital video disc player, said combined image with said received subsequent bit-map data to produce an updated combined image suitable for display.
3. A digital television comprising:
- (a) means for receiving from a storage means a compressed digital data stream;
 - (b) means for decoding said compressed digital data stream in said apparatus; characterized by:
 - (c) means for receiving from said storage means bit-map data associated with said compressed digital data stream; and
 - (d) means for combining, in said apparatus, said bit-map data received and said video signal to produce a signal representative of a combined image suitable for display.

ART 34 AMDT

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cont

4. The digital television of Claim 3 further characterized by:
 - (a) means for receiving subsequent bit-map data suitable representative of an updated portion of said previously received bit-map data; and
 - (b) means for updating said combined image with said received subsequent bit-map data to produce an updated combined image suitable for display, wherein said updating means is responsive to user input.
5. A method for operating a digital video disc player interconnected by a digital bus to a digital television, the digital video disc player performing the steps of:
 - (a) receiving from a digital video disc coupled thereto an MPEG-PS digital stream;characterized by:
 - (b) converting said digital stream from an MPEG-PS format to a digital stream having an MPEG-TS format; and
 - (c) transmitting said MPEG-TS digital stream to said digital television via an isochronous channel of said digital bus.
6. The method of Claim 5 further characterized by:
 - (a) processing a subpicture stream associated with said MPEG-PS digital stream to generate bit-mapped digital data suitable for display; and
 - (b) transmitting said bit-mapped digital data to said digital television via an asynchronous channel of said digital bus.
7. The method of Claim 6 further characterized by:
 - (a) receiving a user initiated command in response to said displayed bit-mapped digital data;
 - (b) generating an updated subpicture stream in response to said user initiated command;
 - (c) processing said updated subpicture stream to generate an updated bit-mapped digital data; and
 - (d) transmitting said updated bit-mapped digital data.

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